number of novelties which M. Langlassé brought back is rather remarkable and indicates the richness of the country in new forms. In the Leguminosae, represented by 237 numbers, M. Micheli finds 26 new species and a new genus, Goldmania, the latter described by Mr. J. N. Rose, of the U. S. National Museum, while many other of the species listed have only recently been published from collections of American botanists. The novelties are illustrated by twenty-eight elegant lithograph plates.— C. R. B.

A CRITICAL ACCOUNT of the algae of northwestern America by Setchell and Gardner[8] has appeared as one of the admirable publications of the University of California. In this paper of 250 pages, with 10 plates, are listed all the known species of algae, excluding the diatoms and desmids, found north of Cape Flattery to the region of Kotzebue Sound in the Arctic coast of Alaska. The authors have had access to a large number of collections, many of them gathered by government parties and other expeditions, and have themselves visited much of the region. They have handled, therefore, probably the largest amount of material ever brought together from this region.

The species are enumerated under the most generally accepted classification, with explicit references to all the specimens examined, and with critical notes on their conditions and peculiarities of structure, habit, and distribution.

A large number of new species and forms are described and figured. Although attention is called to them by printing the names in heavy type, the taxonomic compiler must laboriously pick them out from the main body of the account. A list of these new species properly indexed would have obviated this difficulty.

The authors have refused to change names or upset well-established nomenclature by the application of arbitrary rules, "holding that a name which has been recognized for a quarter of a century, or thereabouts, is to be considered fixed and not to be unsettled simply because another may have been proposed earlier, but hitherto neglected for good or even for no real reasons."— B. M. DAVIS.

NOTES FOR STUDENTS.

KNY[9] finds in three plants (*Lupinus albus, Lepidium sativum, Vicia sativa*) that diffuse daylight retards the growth in length of soil roots, while darkness is advantageous to it.— C. R. B.

ZEILLER describes[10] the occurrence of species of Zamites, Sphenopteris, and Pagiophyllum, from the Upper Jurassic of the province of Catalonia in

[8] SETCHELL, W. A., and Gardner, N. L., Algae of northwestern America. Univ. Calif. Pub. Bot. **1**: 165–418. *pls. 17–27.* 1903.

[9] KNY, L., Ueber den Einfluss des Lichtes auf das Wachsthum der Bodenwurzeln. Jahrb. Wiss. Bot. **38**: 421–446. 1902.

[10] ZEILLER, RENE, Sobra algunas impresiones vegetales del Kimeridgense de Santa Maria de Meya. Memor. Real Acad. cienc. y artes Barcelona.

Spain. Two new species, *Pityophyllum flexile* and *Pseudoasterophyllites Vidali*, are likewise figured and described. The first is considered, as the name indicates, to represent fossilized leaves of a species of Pinus. The second after a process of exclusion, the author is disposed to regard as of cupressineous affinities.—E. C. JEFFREY.

IN Comptes Rendus de l'Académie des Sciences, Paris (March 30, 1903), M.C. Queva gives an account of the structure of the rootlets of *Trapa natans*.[11] These are of particular interest because they present the only case known among the phanerogams of a monarchous root. Roots of this type have in the past only been known for the lycopods (unless the rather doubtful case of Ophioglossum be also included), and indeed are almost diagnostic of the radicels of that group.—E. C. JEFFREY.

FROM AN extended study of protoplasmic streaming in plants, carried out by Ewart,[12] it appears that these movements are produced by the energy of surface tension, this being made available perhaps, by the action of electric currents transversing the moving layers. Such currents could be maintained by chemical action in the protoplasm. The movement does not depend directly upon oxygen access, for species of Chara and Nitella continue to exhibit motion for six to eight weeks in entire absence of free oxygen. —BURTON E. LIVINGSTON.

FROM INTERNAL structure and by comparison with specimens having the exterior preserved, Weiss[13] identifies a reproductive branch of a lepidodendroid found near Stalybridge, England, as belonging to the well-known species *Lepidophloios fuliginosus*, and constituting its reproductive branch. The identification is of interest, not only because it reveals the nature of the reproductive main axis of *Lepidophloios fuliginosus*, but also because the axis in question differs from other axes of the genus in having a biseriate instead of a quincuncial arrangement of the cone-scars.—E. C. JEFFREY.

THE curiously modified leaf-members, found in a few living ferns, *e. g.*, *Hemitelia capensis*, but occurring much more commonly in fossil genera, were examined by Potonié[14] from the physiological and morphological standpoints. He concludes that the structures in question are water-absorbing organs, and are specialized pinnae or pinnules as the case may be. The aphlebia or modified pinnae of *Hemitelia capensis* have been compared by

[11] QUEVA, C., Structure des radicelles de la macre. Compt. Rend. Acad. Sci. Paris **136**: 826–7. 1903.

[12] EWART, A. J., On the physics and physiology of protoplasmic streaming in plants. Proc. Roy. Soc. London **69**: 466–470. 1902.

[13] WEISS, F. E., A biseriate halonial branch of *Lepidophloios fuliginosus*. Trans. Linn. Soc. London Bot. II, **6**: 217–235. *pls. 22–26*. 1903.

[14] POTONIÉ, H., Zur Physiologie und Morphologie der fossilen Farnaphlebien. Ber. Deutsch. Bot. Gesells. **21**: 152–164. *pl. 8*. 1903.

Goebel, in regard to their physiological function, with the whole leaf-organ of the Hymenophyllaceae, and the present author suggests that the aphlebia of fossil ferns are to be similarly interpreted.— E. C. JEFFREY.

THE CONDITIONS governing the germination of the spores of the brown rust of bromes (*Puccinia dispersa* Erikss.) have been closely studied by Ward.[15] This rust is an excellent example of a parasite very closely restricted to certain species of hosts, yet forms were found bridging over widely separated sections of the genus. It is interesting to know that these uredospores retain their vitality for long periods, month-old spores germinating readily, and certain forms after sixty-one days. But the conditions governing the germination of uredospores are very uncertain, for there are internal factors, such as the age of the spore-bearing mycelium and degree of ripeness, beside the external factors of temperature, aeration, moisture, etc.— B. M. DAVIS.

PALLADINE AND KOMLEFF[16] have determined that the respiratory energy of cut etiolated leaves of *Vicia faba* placed in solutions of cane sugar is greatest when the solution has a concentration of about 5 per cent. This fact seems not to depend upon sugar assimilation, for the latter increases with the concentration at least as far as a 20 per cent. solution, the highest concentration tested. But the respiratory energy is greatest when there is the largest amount of insoluble proteid substances present in the leaves, a condition attained in a 5 per cent. solution of cane sugar. When the leaves are transferred from one concentration to another respiration is augmented with decrease and diminished with increase of concentration. This supports the view that foods are not directly consumed in respiration.— BURTON E. LIVINGSTON.

"THE AECIDIUM as a device to restore vigor in the fungus" is the subject of a short discussion by Professor Arthur,[17] who believes that the aecidium with the accompanying spermogonia represents the original sexual stage of the rust. It appears that wheat infected from aecidial spores will produce teleutospores (black rust) much more quickly than if the infection be through uredospores, and it is well recognized that the black rust is more injurious to the wheat than the red rust. Hence the author regards the aecidiospore as more virile than the uredospore, since it produces a more vigorous and harmful parasite. The question, however, suggests itself whether this added virility has really any connection with the organ called the aecidium. It is possible

[15] WARD, H. M., Further observation on the brown rust of the bromes, *Puccinia dispersa*, and its adaptive parasitism. Ann. Mycol. **1**: 132–151. 1903.

[16] PALLADINE, W., and KOMLEFF, A., L'influence de la concentration des solutions sur l'énergie respiratoire et sur la transformation des substances dans les plantes. Rev. Gén. Bot. **14**: 497–516. 1902.

[17] ARTHUR, J. C., The aecidium as a device to restore vigor to the fungus. Proc. Soc. Prom. Agric. Sci. **23**: 1–4. 1903.

that the mere change of host (wheat to barberry and back to wheat) may give to the rust that variety of life conditions which is generally beneficial to every organism, in contrast to monotony of food and environment.— B. M. DAVIS.

IKENO[18] has continued his studies on spore formation in Taphrina which were first reported in Flora **88**: 229. 1901. He finds essentially the same conditions in several species that he described for *Taphrina Johansoni*. There is always the fusion of two nuclei in the ascus preliminary to spore formation. The chromatin material in the fusion nucleus may split up into a number of fragments, which become scattered in the cytoplasm by the dissolution of the nuclear membrane and organize very small nuclei. Or, division may proceed more regularly through successive halving of the chromatin, sometimes accompanied by simple mitotic phenomena. There is generally at the end extensive multiplication of the nuclei by fragmentation and division of the spores by budding. No asters were discovered to cut out the spores as in the higher Ascomycetes, but the cytoplasm seems to gather more densely around the nuclei and form the spore wall. There is no evidence in the ascus of cleavage by constriction.— B. M. DAVIS.

THE LARGE PROPORTION of the seeds of the darnel (*Lolium temulentum*) are infected with a fungus which causes the development of a substance (lolium) with toxic effects upon man and certain carnivorous animals, but not injurious to pigs, cattle, or geese. This interesting parasite has been recently studied by Freeman.[19] No spores are known, and the fungus apparently passes from one generation of the host to the next with the seed. It does not appear to harm the darnel; on the contrary, the infected seeds seem to be larger and better developed than those free from the fungus. Infected seeds germinate very well. There is, therefore, the possibility of an advantage to the host, but this is not positively known. The relationships of the fungus have been much discussed, but in default of spore fructifications the conclusions are mere speculations. The invasion of the young seedling from the coats of the seed and the later appearance on the ovaries is smut-like, but there are also points of resemblance to ergot, and especially to an ergot that frequently attacks Lolium in England.— B. M. DAVIS.

A MEMOIR on Todea, of the same admirable character as former works of the senior author on ferns possessing at the same time fossil and living representatives, is published by Seward and Ford.[20] The anatomy of the mature stem of *Todea barbara*, *T. superba*, and *T. hymenophylloides* is

[18] IKENO, S., Die Sporenbildung von Taphrina-Arten. Flora **92**: 1–31. *pls. 1–3.* 1903.

[19] FREEMAN, E. M., The seed-fungus of *Lolium temulentum* L., the darnel. Phil. Trans. Roy. Soc. London B. **196**: 1–27. *pls. 1–3.* 1903.

[20] SEWARD, A. C., and FORD, SYBILLE O., The anatomy of Todea with notes on the geological history and affinities of the Osmundaceae. Trans. Linn. Soc. London Bot. II. **6**: 237–260. *pls. 27–30.* 1903.

described. The results of Faull in the two former species are in the main confirmed. The last species is of interest because, like *Osmunda cinnamomea*, it has an internal endodermis surrounding the pith in the adult; but unlike the latter this does not appear in the young axis. The figures and description of the authors leave some room for doubt as to the entire accuracy of of this statement, for they do not follow the central cylinder to a sufficient height in the sporeling to exclude their having missed the first appearance of the internal endodermis. An admirable résumé of the fossil Osmundaceae is given, from which it appears how unsatisfactorily meager is our knowledge of this interesting group of ferns, particularly on account of the paucity of specimens from the Mesozoic.—E. C. JEFFREY.

VARIOUS PERIODIC phenomena in connection with the growth and development of plants are well known. Many of these depend upon conditions at present wholly unknown and are designated, therefore, as autonomous. As illustrations may be cited the grand period of growth, the variation in the length of internodes and often of interfoliola (by which Münter long ago designated the spaces between the pinnules on the common petiole). Tammes[21] has endeavored to determine the influence of the presence or absence of leaves upon some of these periodic phenomena. Thus he finds that if all leaves be removed from an annual shoot the periodicity in the length of the internodes is not disturbed, the elongation of the cells only being interfered with, so that the internodes remain shorter than in the living shoot. But the removal of one or more leaves does disturb the periodicity. Certain internodes have less length than in the normal shoots. One would expect that each leaf would affect only the growth of those internodes adjacent to it, but this is not the case, internodes above as well as below the removed leaves being influenced. Often more strikingly than the annual shoots the interfoliola show a similar effect from the removal of leaflets.—C. R. B.

LIDFORSS[22] has investigated the geotropic response of some spring plants whose geotropism is influenced by variations of temperature. These are almost exclusively plants which conclude their development before the warm season. He finds that many of these shoots at lower temperatures are diageotropic, while at higher temperatures they are apogeotropic. This he considers a typical case of dynamic anisotropism. Somewhat similar reactions, however, may be due to changes in temperature alone. In general those shoots whose geotropic reactions are influenced by alterations of temperature are more or less epinastic at lower temperatures, but this epinasty, which reaches its maximum a little above zero, disappears completely at temperatures above 20 degrees. At low temperatures darkness may also affect

[21] TAMMES, T., Die Periodicität morphologischer Erscheinungen bei den Pflanzen. Verhandl. Konigl. Akad. Wetens. Amsterdam. II. **9**: no. 5. 1903.

[22] LIDFORSS, B., Ueber den Geotropismus einiger Frühjahrspflanzen. Jahrb. Wiss. Bot. **38**: 343–376. *pl. 3*. 1902.

geotropic reactions, so that shoots diageotropic in light become apogeotropic in darkness.

Lidforss holds that the term "psychrocliny," introduced by Vöchting, includes a series of phenomena which doubtless have the same ecological importance, but are in no wise equivalent physiologically. Unless the term be reserved as a physiological one for those cases in which temperature actually produces a modification of the geotropism, he thinks it should be abandoned.—C. R. B.

A NUMBER of Bulletins of the United States Agricultural Department deserve brief mention.

VON SCHRENK[23] discusses among other subjects the relation of water to the decay of timber, how timber is seasoned, seasoning tests with lodgepole pine and oak, and tests with telephone poles.

GRAVES AND FISHER[24] treat of the woodlands of southern New England. Improvement cuttings, reproduction cuttings, platting, pruning, protection of the woods and other subjects are well handled.

In another bulletin VON SCHRENK[25] has investigated the cause of the blue color of dead wood in *Pinus ponderosa* (which he finds due to the blue fungus, *Ceratostomella pilifera* (Fr.) Winter), the effect of coloring on the value of the wood, the reason for the decay of wood and how prevented, and whether it would be possible to use the dead wood before it decays. The bark beetle (*Dendroctonus ponderosae*) spreads the fungus, therefore it is recommended that the dead wood be removed at once, for standing beetle-infested trees serve to spread the insect.

HERTY[26] shows that an improved method of turpentine orcharding will increase profits sufficiently to warrant its adoption by any turpentine operator.—H. N. WHITFORD.

VAN WISSELINGH, in his earlier papers upon karyokinesis in Spirogyra, devoted his attention to the nucleolus and the nuclear net-work. In the fourth paper[27] of the series he deals with the nuclear membrane, the spindle, and the walls of the vacuole. *Spirogyra triformis*, a species with thin walls

[23] VON SCHRENK, HERMANN, assisted by HILL, REYNOLDS, Seasoning of timber. Bull. No. 41. Bureau of Forestry, U. S. Dept. of Agric. pp. 48. *pls. 28. figs. 16.* 1903.

[24] GRAVES, H. S. and FISHER, R. T., The woodlot: a handbook for owners of woodlands in southern New England. Bull. No. 42. Bureau of Forestry, U. S. Dept. of Agric. pp. 89. *pl. 4. fig. 30.* 1903.

[25] VON SCHRENK, HERMANN, The "bluing" and the "red rot" of the western yellow pine, with special reference to the Black Hills forest reserve. Bull. No. 36. Bureau of Plant Industry. U. S. Dept. of Agric. pp. 40. *pls. 14.* 1903.

[26] HERTY, C. H., A new method of turpentine orcharding. Bull. No. 40. Bureau of Forestry, U. S. Dept. of Agric. pp. 43. *pls. 15. figs. 5.* 1903.

[27] WISSELINGH, C. VAN, Untersuchungen über Spirogyra. Vierter Beitrag zur Kenntniss der Karyokinese. Bot. Zeit. **60**: 115–138. *pl. 5.* 1902.

and loose, delicate chromatophores, was chosen for study. Material was fixed in Flemming's solution and afterward treated with a strong solution of chromic acid (40 per cent.), which dissolved successively the cytoplasm, karyoplasm and nucleolus, but did not dissolve the spindle fibers. Sections do not seem to have been used.

During the earlier stages of karyokinesis the nuclear membrane is entirely resorbed. The spindle is derived from the granular cytoplasm about the nucleus and consists of but one kind of fibers, the two different lengths of fibers and the two opposite groups described by Strasburger for *Spirogyra polytaeniata* not appearing in *S. triformis*. The spindle fibers do not grow through the nuclear membrane as described by Strasburger. The spindle is at first multipolar, but becomes bipolar. There is no diminution in the number of spindle fibers during karyokinesis, but after karyokinesis the spindle fibers become resolved into cytoplasm. The spindle fibers resist the action of chloral hydrate and so are easily distinguished from cytoplasmic strands. The walls of the vacuoles are also made visible by chloral hydrate. During karyokinesis the walls of the vacuoles with some cell sap press between the spindle fibers and appear within the spindle. Between the two halves of the nuclear plate a number of plasma strands are formed inclosing the spindle fibers, but there is no persistent, closed connecting tube as described by Strasburger for *S. polytaeniata*.—CHARLES J. CHAMBERLAIN.

A NUMBER of fossils, brought together by the late Sir William Dawson, have been described by Penhallow.[28] The first lot are from the Lower Cretaceous of Queen Charlotte islands, and the Upper Cretaceous of Port McNeil, Vancouver island. Several ferns are described, among them a new species, *Osmundites skidegatensis*, from Skidegate Inlet, Queen Charlotte islands, which is referred to at length in connection with a fuller subsequent description. Of gymnosperms there are species of Cycadites, Zamites, Ginkgo, and Sequoia. In *Sequoia langsdorfii* (Brongn.) Heer, the wood is described for the first time, although the foliage and fruit have long been known. The wood is of special interest because like that of *S. sempervirens*, the living species which so closely resembles *S. langsdorfii*, otherwise, it contains resin-canals such as are in general confined to the woody tissues of the Abietineae. The second lot of material is from the early Eocene of Blind Man river, N. W. T. of Canada, and includes a number of ferns, an Equisetum, and several gymnosperms. Several monocotyledonous and dicotyledonous species are also described and figured.

In another paper[29] Penhallow gives a fuller description of the fossil *Osmundites skidegatensis*, mentioned in the article referred to above. The

[28] PENHALLOW, D. P., Notes on Cretaceous and Tertiary plants of Canada. Trans. Roy. Soc. Canada II. **8**:31–91. 1902.

[29] PENHALLOW, D. P., Osmundites skidegatensis. Trans. Roy. Soc. Canada II. **8**:3–30. 1902.

account is based on the study of material collected by Dr. F. C. Newcombe from Alliford Bay, Skidegate Inlet, Queen Charlotte islands, and is illustrated by a number of photographs and photomicrographs, which testify to the admirable preservation of the fossil. The author concludes that the fossil represents a plant of the general habit of *Osmunda regalis*, but is much larger than any of the species of that genus found in North America. Internally it resembles Osmunda on the one hand and Todea on the other; but the resemblance seemed on the whole to be closer to Osmunda than Todea, so the fossil is included by the author in the genus Osmundites.— E. C. JEFFREY.

HABERLANDT sums up the present data of the statolith theory of geotropic preception,[30] prefacing his paper with a short historical account of the development of the same theory for animals. He answers certain objections which have been raised and contributes some new support to the theory, which now seems reasonably established for a considerable number of plants. Starch-bearing cells of the root cap in roots and of the starch sheath in stems (which is present in the majority of phanerogams, although Fischer, investigating too old portions of the stem, found it often wanting) are the preceptive organs, except in certain cases, where the geotropism is limited to the nodes, or where sharply differentiated groups of cells with movable starch grains replace the absent starch sheath. The preceptive apparatus is found to have degenerated in stems which have lost their geotropic sensitiveness, and to be lacking in organs which show no reaction to gravity. In general the root caps of apogeotropic climbing roots either contain no starch grains or non-motile ones. In orthotropous organs the protoplasmic membranes next the lower and upper transverse walls of the preceptive cells are not sensitive; only the membranes of the tangential longitudinal walls are irritable, and especially that of the outer wall in apogeotropic organs and that of the inner wall in positively geotropic organs. Whether both tangential walls of the same cell are sensitive is uncertain. In the nodes of grasses there is no ground for admitting this. The protoplasmic membranes on the radial walls are probably not sensitive. Any process which removes the starch from the starch sheath at the same time stops geotropic response, which, however, may begin again when the starch is regenerated. Czapek's demonstration of this in roots, from which starch disappeared when they were inclosed in plaster casts, is now supplemented by Haberlandt's experiments in removing starch by subjecting plants to low temperatures and then bringing the protoplasm into a condition of sensitiveness by raising the temperature. Until some hours have elapsed and starch grains have begun to appear, the geotropic sensitiveness does not manifest itself. Further experiments show that the action of gravity as a stimulus rests upon the static pressure of solid bodies. Further-

[30] HABERLANDT, G., Zur Statolithentheorie des Geotropismus. Jahrb. Wiss. Bot. **38**: 447–500. *fig. 3.* 1902.

more the time occupied by the fall of the starch grains through the cell fluids to the new position, which may be designated as the migration time, is shown to be usually less than half the presentation time. The migration time may be diminished by repeated mechanical jarring, in which case the presentation time is correspondingly diminished. It seems probable to the reviewer that subjecting plants to centrifugal action might reduce the migration time to a minimum and so demonstrate more clearly this relation.—C. R. B.

THE SEXUAL ORGANS and the development of the ascocarp of Monascus are described by Barker[31] in a paper of especial interest in relation to the problems connected with coenogametes among the Phycomycetes and Ascomycetes. A filament develops terminally an antheridium. Immediately below this cell the ascogonium is formed, whose growth pushes the antheridium to one side. Both sexual organs are multinucleate (coenogametes). They fuse by means of a small process put forth from the antheridium. After fertilization the ascogonium becomes divided by a cross wall, the anterior small cell remaining in connection with the antheridium, and the posterior, named the "central cell," developing the ascocarp.

After fertilization the central cell becomes invested by a growth of hyphae from below. The central cell now increases greatly in size, and the next change is the development of ascogenous hyphae in a little depression at one side of the central cell. The ascogenous hyphae gradually fill the interior of the ascocarp, eventually forming small eight-spored asci. The central cell plays a curious part in the later developments of the ascocarp. The growth of the ascogenous filaments so presses upon it as to force its wall inward, giving it the shape of a bowl. The ascogenous hyphae thus appear as an internal development, but their origin is plainly external. Later the contents of the central cell disappear, and its walls become cutinized, so that they actually form a hollow sphere around the ascogenous hyphae. Since the latter break down with the ripening of the spores, the mature ascocarp has the appearance of a simple sporangiumlike structure, which it is not.

Barker regards Monascus as a very lowly ascomycete, with relationships rather nearer to the Gymnoascales than to any other group. A number of points in his general discussion are treated in a note that follows my paper on Oogenesis in Saprolegnia.[32]—B. M. DAVIS.

[31] BARKER, B. T. P., The morphology and development of the ascocarp in Monascus. Ann. Bot. **17**: 167–236. *pls. 12, 13.* 1903.

[32] BOT. GAZ. **35**: 344. 1903.